

## REMARKS/ARGUMENTS

This is a response to the Final Office Action dated February 9, 2009. Claims 5 and 6 have been amended. Claim 18 has been canceled without prejudice to resubmission. Upon entry of this amendment, claims 1-17 and 19-20 will be pending in the present application.

Claim 5 has been amended to require that each micromirror in the micromirror array can be positioned in up to and including 320 positions in each tilt direction. Basis for this amendment may be found, for example, at page 8, lines 1-13 and at page 8, line 26 to page 9, line 2 of the specification as originally filed.

Claim 6 has been amended to require that each micromirror may be positioned in up to and including 102,400 positional states. Basis for this amendment may be found, for example, at page 8, lines 1-13 and page 8, line 26 to page 9, line 2 of the specification as originally filed.

In view of the following remarks, Applicant respectfully requests favorable consideration, withdrawal of the rejections and issuance of a Notice of Allowance.

### *1. The 112 Rejections*

Claims 5-6 and 17-18 have been rejected under 35 USC §112 for lack of an adequate written description.

Claim 5 has been rejected for failure to provide support in the specification that each micromirror may be positioned in more than 320 different positions in each tilt direction. Claim 5 has been amended to require that each micromirror may be positioned in up to and including 320 different positions in each tilt direction. Support for claim 5 may be found on page 8, lines 1-13 of the specification, which describes an exemplary micromirror array having two tilt axes. In each axes, the array may be tilted over an angle of  $\pm 8$  degrees (i.e. a total of 16 degrees) that is “controllable to within 0.05 degrees” (See Specification page 8, line 8). Therefore, each micromirror in the array can be positioned in up to and including 320 states (i.e. 16 degrees/0.05 degrees = 320 states) in each tilt direction.

Because the specification expressly states that the micromirrors may be controllable “to within 0.05 degrees,” rather than merely asserting incremental movement of 0.05 degrees, the specification expressly discloses movement of the micromirror over increments greater than 0.05 degrees. Merriam Webster defines “within” as a “not beyond the quantity, degree, or limitations of ... in or into the range of” (See Excerpt of Merriam Webster’s 9<sup>th</sup> Collegiate Dictionary 1984).

“[W]ithin 0.05 degrees” indicates that the micromirrors may move in increments that are greater than 0.05 degrees. If the increments are greater than 0.05 degrees, the micromirror will be positionable in less than 320 positions in each tilt direction. Therefore, the specification provides basis for claim 5, as amended.

Claim 6 has been rejected for failure to provide support in the specification for the claim limitation that a micromirror may be oriented in more than 100,000 positional states. According to page 8, lines 26-29 and page 9, lines 1-2 of the specification, the exemplary micromirror is positionable in up to a total of 320 positions in each tilt direction, as discussed above. Thus, the maximum number of possible states for each micromirror is  $320 \times 320 = 102,400$  positional states, (which was rounded down to 100,000 states in the application as originally filed). As discussed above, because each micromirror can be positioned in up to 320 positions in each tilt direction, the mirror array may have a total of up to 102,400 positional states. Consequently, there is basis in the specification for claim 6, as amended.

Claim 17 has been rejected for failure to provide support in the specification for extracting the relevant color values more than 70 times. The Examiner is correct that the passage cited by the applicant on page 9, lines 23-25 of the original specification only discloses extracting the relevant color values exactly 70 times. However, the specification additionally indicates at page 9, lines 30-33 that more than 70 images may be acquired to obtain higher resolutions. Thus, there is basis at page 9, lines 23-25 and 30-33 of the original specification for the language of claim 17. Withdrawal of the rejection is requested.

Claim 18 has been rejected for failure to provide support in the specification for extracting the relevant color values more than 100,000 times. Although the applicant does not concede the correctness of this objection, claim 18 has been canceled to obviate the rejection and advance prosecution of the present application.

## **2. The Prior Art Rejections**

Claims 1-4 and 7-20 have been rejected pursuant to 35 U.S.C. §102(b) as being anticipated by U.S. Patent no. 5,212,555 (Stoltz). This rejection is respectfully traversed. Reconsideration is requested for the reasons which follow.

Stoltz discloses an imaging system that includes a deformable mirror device (DMD) 11 having a plurality of mirror elements 41 that reflect light from an object. Optical sensors 15 are

required to receive and convert the reflected light to electrical energy. While the mirror elements 41 are movable by a torsion beam, cantilever supports or elastomer or membrane designs, they are only designed to assume two positions: an “on position” wherein light is directed towards a sensor and an “off position” wherein light is directed away from the sensor (See Stoltz col. 3, lines 45-51, 65-68; col. 4, lines 1-4). In operation, sensor 15 detects light reflected from each of the mirror elements 41 one mirror at a time in a predetermined sequence until all the pixels of an image frame have been analyzed (See Stoltz col. 4, lines 65-68; col. 5, lines 1-2). Each mirror element 41 reflects only one designated pixel of a particular image (See Stoltz col. 4, lines 61-64).

By contrast, Applicant’s imaging system includes a micromirror array having a plurality of micromirrors that enable efficient image processing and production of high resolution images. Each of the micromirrors of the array of the present invention are capable of tilting in at least two different axial tilt directions enabling each mirror to reflect at least two different sets of pixels of a particular image (See Application Figs. 1(a)-1(b)). This ability of each of the micromirrors to reflect more than one set of pixels of a particular image increases image resolution without requiring a corresponding increase in the number of micromirrors or sensors, as would be the case in the Stoltz imaging system. (See application page 6, lines 27-33; page 7, line 1).

With respect to independent claim 1, Stoltz fails to disclose all the requisite claim elements. Namely, Stoltz fails to disclose:

1. a micromirror that reflects different sets of pixels representing locations of a scene to a photographic imaging device; and
2. an assembly system that forms a high resolution image by mosaicing information extracted from the different sets of reflected pixels.

In the Final Office Action, the Examiner asserts that “the claim language merely requires the reflection of ‘different sets of pixels representing locations of the scene’” and that “each mirror in the embodiment shown in Figure 4 [of Stolz], it[sic.] capable of” this function (See page 3 of the Final Office Action). Applicant respectfully submits that a single mirror element 41 of Stoltz is incapable of reflecting different sets of pixels of an image and that Stoltz also does not disclose a system capable of producing a high resolution image by mosaicing information extracted from each of the different sets of pixels reflected by the micromirror. Rather, each mirror element 41 of Stoltz reflects only a single designated pixel of an image (See Stoltz col. 4, lines 61-64). The archaic mirror elements 41 of Stoltz’s DMD 11 are simple binary structures

designed to assume two possible positions: an “on position” wherein light is directed towards a sensor 15 to reflect a single pixel of an image and an “off position” wherein light is directed away from the sensor 15 and no reflection of the image is transmitted to sensor 15 (See Stoltz col. 3, lines 45-51, lines 65-68; col. 4, lines 1-4). Because each of Stoltz’s mirror elements 41 is restricted to reflecting a single designated pixel and only has 2 positional states, i.e. an on position and off position, the mirror elements of Stoltz are not capable of reflecting different sets of pixels, as required by claim 1 of the present application. Furthermore, Stoltz does not disclose a high resolution image generated from information taken from each set of of the reflected pixels reflected by the same micromirror.

Relying on Stoltz’s statement that, “Fig. 4 ... increas[es] resolution for a given operating speed” (See col. 5, lines 48-51), the Examiner further argues that Stoltz inherently discloses that mirror elements 41 reflect different sets of pixels. The Examiner rationalizes that the increased resolution at a given operating speed can only be achieved by enabling the mirror elements to reflect multiple or different sets of pixels. Applicant respectfully disagrees. Inherency can only be established when the allegedly inherent feature would necessarily flow from the teachings of the prior art reference. According to MPEP §2112,

“The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) ... “To establish inherency, the extrinsic evidence ‘must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.’ ” *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999)

“In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.” *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)”

Reflecting different sets of pixels with each micromirror in the micromirror array and producing a high resolution image by mosaicing information extracted from the different sets of pixels is not necessary for and does not necessarily flow from the statement in Stoltz that Fig. 4 is capable of increasing resolution for a given operating speed. In fact, a close reading of Stoltz makes it clear that this is not the case and that Stoltz is still discussing a micromirror array wherein each mirror is only capable of two positional states, on or off.

The embodiment of Figure 4 of Stoltz is used to increase operating speed for a given image resolution or to increase image resolution for a given operating speed. See col. 5, lines 48-51 of Stoltz. In relation to Figure 4, Stoltz first describes a system that addresses 2 mirror elements 41 of DMD 11 at one time in parallel. Light from a first pixel of an object is directed to a first mirror element 41 of DMD 11 by lens 13, reflected from the first mirror element 41 and directed by lens 14a to a first sensor 15a. Simultaneously, in parallel, light from a second pixel of the object is directed to a second mirror element 41 of DMD 11 by lens 13, reflected from the second mirror element 41 and directed by lens 14b to a second sensor 15b (See col. 5, lines 48-53 of Stoltz. Note that in Fig. 4 of Stoltz, first sensor 15a is incorrectly labeled as "15" and second sensor 15b is incorrectly not labeled). This embodiment may be used to increase operating speed for a given resolution because it addresses two mirror elements simultaneously, in parallel, by providing two separate sensors 15a and 15b, and a complex set of lenses 13, 14a and 14b. Since the additional sensor 15b allows parallel processing of reflections from two mirror elements 41, an image having a given resolution can be generated twice as quickly (See col. 5, lines 55-58 of Stoltz).

The statement that "Fig. 4 ... increas[es] resolution for a given operating speed (See col. 5, lines 48-50) can be explained by the fact that the parallel processing of two mirror elements 41 of DMD 11 enables the system of Fig. 4 to address twice as many pixels of an image in the same time frame as would have been addressed by the system of Fig. 1 of Stoltz where the provision of only one sensor 15 allows the system to address only a single mirror element 41 at a time. Because the parallel processing of two mirror elements 41 simultaneously permits DMD 11 of Figure 4 to address two pixels of an image at a time, the system of Fig. 4 of Stoltz can provide twice the resolution as the system of Fig. 1 of Stoltz if both systems are operated for the same time period. Nowhere does Stolz suggest or even contemplate that the higher resolution is a result of using a single mirror element 41 to reflect different sets of pixels as claimed in the present application.

In view of the foregoing explanation, Applicant therefore respectfully asserts that Stoltz does not inherently disclose reflecting different sets of pixels using a single micromirror and producing a high resolution image by mosaicing information extracted from these different sets of pixels.

Referring to the embodiment of Figure 4, the statement that “[d]ifferent tilt positions of the pixel elements, as shown in Fig. 2B, could be used to direct light to sensors 15a and 15b without interference” (See col. 5, lines 53-55) also does not explicitly or inherently disclose using a micromirror to reflect different sets of pixels. Stoltz is merely stating that each mirror element 41 may be tilted to a position so that the light reflected to sensor 15 is transmitted to sensor 15 and without interference from nearby light waves. Light interference may occur when light waves interact. This may lead to the creation of interference patterns and produce image distortions. Stoltz specifies that its mirror elements 41 may be tilted to different positions than the mirror elements 41 were tilted, for example, in the embodiment of Fig. 1, in order to avoid light wave interference. It does not inherently or explicitly disclose that a single mirror element 41 can be tilted for the purpose of reflecting more than one set of pixels of a particular image.

Stoltz’s statement that “[f]or applications of optics unit 10 that involve generation of moving pictures ... [e]ither faster DMDs or multiple sensors 15 can be used to provide better resolution at the same operating speed” (col. 5, lines 24-25 and 46-47 of Stoltz) also does not inherently disclose reflecting different sets of pixels using a single mirror element. Rather, the reference to using multiple sensors 15 provides better resolution at a given operating speed in the manner described above in relation to Fig. 4 of Stoltz. The reference to using faster DMDs also does not disclose imaging different sets of pixels using a single mirror element 41 for the reasons given below.

The phrase “at the same operating speed” refers to the operating speed of the imaging system. Therefore, according to Stoltz, when the imaging system is operating at a given speed, i.e. 5 frames per second or 0.2 seconds per image frame, it is possible to produce a higher resolution image using a faster DMD, i.e. a DMD that is capable of addressing more pixels within the same 0.2 second time period per image frame. The faster DMD referred to in Stoltz achieves this by being able to turn each mirror element 41 on and off in a shorter time period. This, in turn, allows more mirror elements 41 to be used to address more pixels in the same 0.2 second time period. As a result, this faster DMD provides a higher resolution image for an imaging system operating at a given speed.

Thus, this teaching of Stoltz merely provides that for motion picture applications, it is desirable to increase the speed at which the mirror elements 41 of DMD 11 assume an on or off position in order to increase image resolution. By more quickly switching mirror elements 41 on

and off, it is possible for DMD 11 to address more pixels of an image in the same time frame as compared to a DMD having slower mirror elements 41, thereby producing a higher resolution relative to the DMD having slower mirror elements 41. Accordingly, this embodiment of Stoltz also does not teach or suggest that a single mirror element 41 can be used to address different sets of pixels as is required by the claims of the present application.

For the reasons discussed above, Stoltz fails to anticipate claim 1 or any claims that depend therefrom.

Stoltz also fails to disclose all the requisite elements of independent claim 3. Namely, Stoltz fails to disclose positioning micromirrors at least twice to reflect at least two different sets of pixels representative of a scene to a photographic imaging device (i.e. step (d)), and reflecting a set of pixels representative of locations of a scene.

As discussed above, Stoltz fails to disclose positioning the micromirrors of the array to reflect two different sets of pixels. Rather, each mirror element 41 is designed to reflect only one corresponding designated pixel, and each set of mirrors are only designed to reflect a specific corresponding set of designated pixels (See Stoltz col. 4, lines 61-64). Consequently, Stoltz does not disclose that the mirror elements 41 can be used to reflect more than one set of pixels of a scene, as required by claim 3.

According to MPEP §2181, the Federal Circuit recognizes that the Examiner bears the initial burden of proof to demonstrate that Stoltz inherently discloses the claimed invention. Applicant respectfully submits that in view of the above arguments, this burden has not been met. For the reasons presented above, Stoltz fails to disclose all the elements required by independent claims 1 and 3. Consequently, Stoltz also fails to anticipate claims 1 and 3 and any claims that depend therefrom. Favorable consideration, withdrawal of the rejections and issuance of a Notice of Allowance is requested.

### **3. *Interview Summary***

In accordance with 37 CFR §1.133 and MPEP §713.04, the following is the applicant's summary of the interview conducted on March 31, 2009 in relation to the above-identified application.

Applicant's representative, Grace S.C. Doe, on behalf of Applicant R. Andrew Hicks, conducted a telephonic interview with Examiner John Villecco on March 31, 2009 regarding the present application, addressing the rejection of claims 1 and 3 over U.S. Patent No. 5,212,555 (hereinafter "Stoltz").

During the interview, applicant's representative argued that Stoltz discloses a simple binary system wherein the micromirrors have only 2 positional states, an on position for reflecting a single pixel of an image and an off position. Applicant's representative also argued that Stoltz failed to disclose a micromirror capable of reflecting more than one set of pixels of a particular image.

The Examiner took the position that the following statements presented in Stoltz, "Either faster DMDs or multiple sensors 15 can be used to provide better resolution at the same operating speed" or, "Figure 4 illustrates another embodiment of the invention for increasing operating speed with a given resolution or for increasing resolution for a given operating speed" inherently implied that mirror elements 41 must be tilting to reflect more than one set of pixels from a particular image.

The Examiner further indicated that amending the claim to require two axial tilt directions may be favorable for patentability but would require further search and examination.

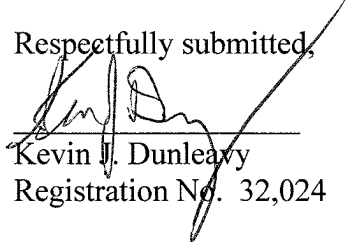
As a result of the interview, the Examiner agreed to withdraw the portion of the rejection that relies on the embodiment of Figure 5 of Stoltz.

No agreement was reached other than stated above, and no other pertinent matters were addressed during the interview.



6. *Conclusion*

Applicant has made an earnest effort to place this application in condition for allowance. If the Examiner feels that a telephone interview would expedite prosecution of this patent application, he is respectfully invited to telephone the undersigned at 215-599-0600.

Respectfully submitted,  
  
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Enclosure: Excerpt of Merriam Webster's Ninth New Collegiate Dictionary (1984)